

ZOOLOGY.—*Some polychaete worms of the families Hesionidae, Syllidae, and Nereidae from the east coast of North America, West Indies, and Gulf of Mexico.<sup>1</sup>*  
MARIAN H. PETTIBONE, University of New Hampshire. (Communicated by Fenner A. Chace, Jr.)

(Received June 14, 1956)

In connection with a study in progress on the polychaetes of the New England region, a species of Hesionidae is herein revised, resulting in a new genus and new combination; a new species of each of the Syllidae and Nereidae are described. From the West Indies and Gulf of Mexico region, a new species of Nereidae is described and supplementary descriptions are given for two other nereid species. The major part of the work was done at the United States National Museum, where the types are deposited.

Family HESIONIDAE

**Parahesione**, n. gen.

**Diagnosis.**—Prostomium with two lateral antennae, two smooth, unjointed palps, two pairs of eyes. Tentacular segments 3, somewhat fused; tentacular cirri 6 pairs (3 pairs on each side). Parapodia distinctly biramous; notopodia forming distinct lobes below the cirrophores of the dorsal cirri, with numerous capillary notosetae; neuropodia with numerous compound setae with blades long and slender. Anal cirri two, long. Proboscis with numerous fine papillae around the opening, without jaws.

**Type.**—*Podarke luteola* Webster, 1880 (= *Hesione agilis* Webster and Benedict, 1884).

*Parahesione* resembles *Syllidea* Quatrefages, *Micropodarke* Okuda, and *Nereimyra* Blainville (= *Castalia* Savigny) in the absence of a median antenna, the presence of 2 palps and 6 pairs of tentacular cirri. It differs from them in that the notopodia are well developed and distinct from the cirrophores of the dorsal cirri, with a distinct bundle of numerous notosetae; the palps are smooth, not biarticulate; also the shape of the neuropodia and proboscis differ markedly.

**Parahesione luteola** (Webster, 1880), n. comb.

Fig. 1, a-c

*Podarke luteola* Webster, 1880, pp. 107-108 (figures referred to not published); 1886, pp. 135-136, pl. 5, figs. 19-20 (repeat of Webster, 1880, plus figures).

<sup>1</sup> This study was aided by a grant from the National Science Foundation (NSF-G2012).

*Hesione agilis* Webster and Benedict, 1884, pp. 707-709, pl. 1, figs. 9-11.

The revision of the species is based on the following: (1) The description of *Podarke luteola* Webster, 1880, 1886, based on a single specimen (11 mm long, 45 segments) found on an oyster-shell in Great Egg Harbor, N. J.; the type specimen is not available; (2) the description and type specimens of *Hesione agilis* Webster and Benedict, 1884 (U.S.N.M. no. 430), found in sandy mud near the high water mark in Wellfleet, Mass.; the types include several small specimens (up to 2.5 mm long, 18 setigers); (3) several specimens collected at Wellfleet Harbor, Mass., on the sandy flats, living commensally in the burrows of *Upogebia affinis* (Say); they move rapidly and easily escape notice; they were up to 15 mm long, 4 mm wide including setae, 37 setigers.

**Description.**—Length up to 15 mm, width including setae up to 4 mm, segments 18-45. Body widest in the middle, tapering gradually anteriorly and posteriorly, flattened dorsoventrally. Prostomium (Fig. 1, a) much wider than long, with 2 pairs dark red eyes, crescentic, closely approximated on each side; two pairs of similar anterior appendages, both pairs delicate, subulate, with very short basal ceratophores; of these anterior appendages, the lateral antennae are slightly more dorsal in position; the palps are smooth, not biarticulate as in many hesionids; a median antenna is lacking (for *Podarke luteola*, Webster indicated it was lost). Three tentacular segments somewhat fused dorsally, usually only one distinct; the 3 pairs of tentacular cirri on each side with short cylindrical basal cirrophores emerging from a common base, lateral to and somewhat fused with the prostomium; styles variable in length, the upper ones longer than the lower ones (some may reach segment 10), readily lost and renewed.

Parapodia, dorsal cirri, and setae all very long (Fig. 1, c). Parapodia distinctly biramous; notopodium a stout papilla below the base of the dorsal cirrus; notosetae numerous, forming a close-set bundle, long (longer than the neurosetae), slender, capillary, transversely striated.

Neuropodia stout, elongated, terminating above in a conical acicular process, diagonally truncate below; neurosetae form a fan-shaped group, compound, stem very long with transverse markings, appendages short and long, entire. Dorsal cirri with short cylindrical basal cirrophores; styles very long (longer than the setae), delicate, tapering uniformly, articulate. Ventral cirri delicate, conical, tapering to slender tips, extending slightly beyond the tips of the neuropodial lobes. Anal cirri long, similar to the dorsal cirri (Fig. 1, b). Proboscis eversible, with larger basal portion and narrower distal portion, with numerous fine papillae around the opening, without jaws. Color: Colorless (small specimens) to reddish yellow, parapodia green and yellow, cirri white; greenish (preserved).

#### Family SYLLIDAE

##### Genus *Brania* Quatrefages, 1866

###### *Brania wellfleensis*, n. sp.

Fig. 2, a-c

The species is based on a single specimen collected at low water, Wellfleet Harbor, on the Cape Cod Bay side, Massachusetts, on sandy bottom among tubes of *Diopatra cuprea* (Bosc), August 25, 1953 (U.S.N.M. no. 27783); another specimen was collected at Chappaquoit, Buzzards Bay, Mass., in muddy sand (U.S.N.M. no. 27784).

*Description.*—Length up to 7 mm, width up to 0.4 mm, segments 38-39. Body tiny, slender, threadlike, cylindrical, widest in the middle, tapering slightly anteriorly and posteriorly, colorless. Prostomium oval, wider than long, with 2 pairs of eyes, anterior pair slightly larger and more lateral, with little extra pigment lateral to the posterior pair of eyes; antennae subulate, wider basally, tapering to more slender tips; median antenna attached posteriorly on prostomium between posterior pair of eyes, about double the length of the prostomium; lateral antennae attached anteriorly on prostomium, anterior to the anterior pair of eyes, extending about as far distally as the median antenna; palps large, prominent, fused on basal third, free distally; the palps may be elongated (Fig. 2, b, sketched from life) or somewhat contracted (Fig. 2, a, preserved). Tentacular segment more or less distinct, with 2 pairs of tentacular cirri, subequal, similar in shape and length to the median antenna. Uniramous parapodia with setae

all compound, except in the last 6 or so posterior segments where there is an upper and lower simple seta (looks like a compound seta that has lost its appendage and become somewhat worn); setae compound falcigerous, with blades short, finely spinous, with tips hooked and entire (Fig. 2, c). First pair dorsal cirri equal in length to tentacular cirri; dorsal cirri lacking on setiger 2; rest of dorsal cirri slightly longer than setal tips. Ventral cirri extend to about the tips of the parapodial lobes. Anal cirri 2, about as long as last 3 segments. Pharynx long, occupying setigers 1-4, may be somewhat coiled when body is contracted; proventriculus occupying setigers 5 to 8.

*Remarks.*—*Brania wellfleensis* differs from *Brania clavata* (Claparède), which includes *Grubea websteri* Verrill and is known from the New England region, in the following:

|                           | <i>B. clavata</i>   | <i>B. wellfleensis</i>  |
|---------------------------|---|---|
| Parapodial setae          | Two kinds: single upper simple one; compound setae with blades shorter to longer, with tips finely bidentate. | Setae all compound (except for some simple setae in last 6 or so posterior segments), with tips of blades entire. |
| Prostomium                | With a pair of small ocular spots near the lateral antennae, in addition to the 4 larger eyes.                | Without ocular spots.   |
| Dorsal cirri on setiger 2 | Present.  | Absent.   |

*Distribution.*—Massachusetts (Wellfleet Harbor, Chappaquoit). In low water.

#### Family NEREIDAE

##### *Nereis* (*Nereis*) *grayi*, n. sp.

Fig. 3, a-g

The species is based on two specimens collected at Hadley Harbor, Uncatena Island in the Woods Hole area, Massachusetts, August 1952 (U.S.N.M. no. 27781, 27782). They were collected by Milton Gray, after whom the species is named. They were found in the thick muddy tubes of the large maldanid, *Maldanopsis elongata* (Verrill). Whether or not they lived commensally with the maldanid or occupied the tube secondarily is difficult to say. An examination of numerous tubes later failed to reveal any of the nereids.

*Description.*—Length up to 60 mm or more, width up to 5 mm, segments up to 150 or more. Body long, slender, tapering very gradually posteriorly, somewhat flattened dorsoventrally,

colorless. Prostomium (Fig. 3, *a*) typical nereid shape, being widest on posterior third, tapering gradually anteriorly to a truncate tip; frontal antennae subulate, at the corners of the truncate tip; palps with basal part large and bulbous, with retractile tip; 4 eyes rather small, subequal, on posterior third of prostomium. Tentacular segment about same length as the following segments; tentacular cirri slender, tapering, the posterior dorsal pair longest, extending to about setiger 8. Anal segment with a pair of short anal cirri.

Parapodia (Fig. 3, *d*, *e*) biramous, except for the first two uniramous pairs, similar throughout the length of the body; they are long, making up about two-thirds the width of the body. Notopodium with 2 subequal, elongated, conical, pointed ligules; neuropodium with bluntly conical setigerous lobe, with a slightly shorter, conical, pointed lower ligule. Both dorsal and ventral

cirri are shorter than the ligules. Notosetae of anterior region homogomph spinigers, rather few in number (about 8 in each notopodium), with rather short blades; beginning on about setiger 27, notopodia with few (1-2), homogomph falcigers with oval blades (Fig. 3, *g*). Upper group of neurosetae homogomph spinigers with long slender blades and few heterogomph falcigers (may be lacking on some parapodia); lower group of neurosetae heterogomph spinigers with rather short blades and heterogomph falcigers with rather long blades (Fig. 3, *f*). Acicula dark amber-colored. Proboscis (Fig. 3, *a-c*) with a pair of brown amber-colored jaws, each with about 12 teeth, with paragnaths few in number and small in size; on the maxillary ring: area II with 2 to 3 very small ones; area IV with triangular group of 10 to 13 slightly larger ones; on the oral ring, area VI with 3 to 4 small ones; paragnaths lacking on the other areas.

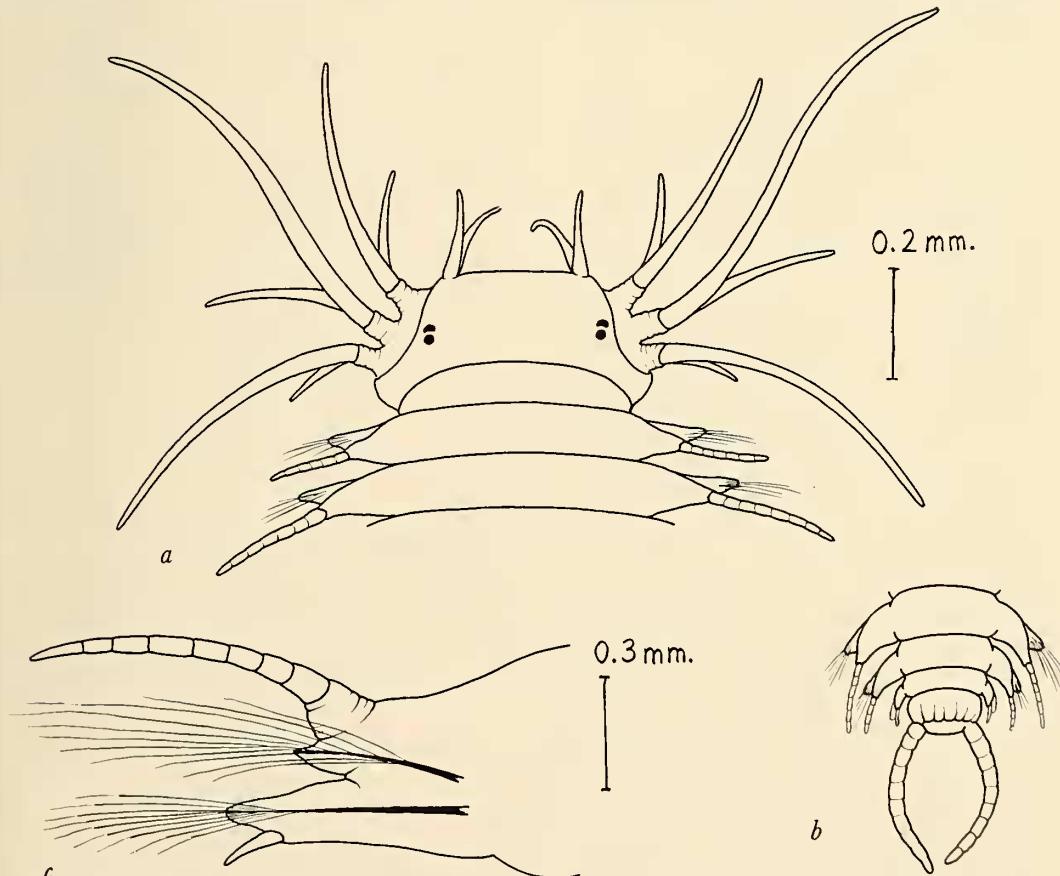


FIG. 1.—*Parahesione luteola*, n. comb.: *a*, Dorsal view anterior end; *b*, dorsal view posterior end; *c*, parapodium.

*Remarks.*—*Nereis grayi* resembles *Nereis (Eunereis) longissima* Johnston rather closely, including the parapodia and the few paragnaths on the proboscis; they differ in the following:

|                                | <i>N. longissima</i>   | <i>N. grayi</i>  |
|--------------------------------|--|--|
| Paragnaths                     | Confined to small group on area VI of oral ring, without paragnaths on maxillary ring. | Small group on areas II and IV of maxillary ring; small group on area VI of oral ring. |
| Tentacular cirri               | Shorter, longest reach about setiger 3.  | Longer, longest reach about setiger 8.   |
| Notopodial homogomph falcigers | Begin on about setiger 65.   | Begin on about setiger 27.   |

*Distribution.*—Massachusetts (Woods Hole region). In low water.

***Nereis egregicirrata* Treadwell, 1924**

Fig. 4, a; 5, a-d

*Nereis (Leptonereis) egregicirrata* Treadwell, 1924, pp. 13-14, fig. 24 (part; English Harbor, Antigua, submarine light, July 1918).

*Nereis egregicirrata* Treadwell, 1939, p. 233, fig. 56 (Santa Barbara, Porto Rico).

The following description is based on 5 specimens in the original type material (2 male and 3 female heteronereids, U.S.N.M. no. 20324) and a male heteronereid collected by M. Jean Allen at Parguera, Porto Rico, from reef in front of the Laboratory, March 23, 1955. The atokous form is unknown.

*Description of male and female heteronereids.*—Body divided into two distinct regions: anterior unmodified, with the usual type of setae; posterior modified with the usual type of setae replaced by swimming setae and the development of lamellae instead of ligules. Prostomium (Fig. 4, a) with anterior part bent down ventrally, thus the frontal antennae and palps are not visible dorsally; four eyes large, subequal, purple, with distinct lenses, the two on each side closely appressed. Tentacular cirri 4 pairs, 3 of which are rather short, somewhat articulated, fourth pair longer, may extend to setiger 5, distinctly to slightly articulated. Parapodia of anterior unmodified region (Fig. 5, a, c) with dorsal cirri subulate, longer than the ligules; notopodia with upper and lower conical to rounded ligules, with a third, shorter (supraacicular) ligule between them, with homogomph spinigerous setae; neuropodia with conical setigerous lobe with anterior and posterior lips, with lower conical ligule; upper group of neurosetae homogomph spinigers and heterogomph falcigers; lower group of neurosetae

heterogomph spinigers and falcigers; heterogomph falcigers with short blades, similar to Fig. 6, c; ventral cirri subulate, about same length or slightly shorter than the neuropodial ligule; acicula dark amber-colored. Proboscis with amber-colored jaws each with about 12 teeth; with conical paragnaths on both maxillary and oral rings (exact arrangement?). Color (in alcohol): With faint transverse brownish bands dorsally and with darker glandular areas dorsally at bases of parapodia. The male and female heteronereids differ in the following:

|   | <i>Male heteronereid</i>  | <i>Female heteronereid</i>  |
|---|---|---|
| Length  | Up to 13 mm.  | Up to 14 mm   |
| Width   | Up to 1.5 mm in anterior region; up to 2.5 mm in posterior region   | Up to 1 mm in anterior region; up to 2 mm in posterior region   |
| Number of setigers in anterior unmodified region  | 18  | 26  |
| Number of setigers in posterior modified region   | About 67  | About 90  |
| Total number of setigers                          | About 85  | About 116   |
| Posterior end                                     | Anal segment papillated (anal cirri broken off)   | Pair of long articulated anal cirri; anal segment papillated  |
| Dorsal cirri of anterior region                   | First 7 pairs modified (Fig. 4, a): first 5 and seventh pairs elongate, cylindrical, with asymmetrical tips; sixth pair enormously elongate with bulbous base and long style (up to 4 mm long)  | First 7 pairs modified, get gradually longer anterior to posterior  |
| Ventral cirri of anterior region                  | First 5 pairs clubbed   | Same  |
| Parapodia of modified region, with swimming setae | Fig. 5, b.<br>Dorsal cirri with slight indication of annulations or crenulations<br>Extra lamella above base of dorsal cirrus<br>Unequally bilobed supraacicular notopodial lamella<br>Unequally bilobed subacicular notopodial lamella<br>Large postsetal neuropodial lamella<br>Unequally bilobed lower neuropodial lamella<br>Ventral cirri with bilobed lamella above and large lamella below | Fig. 5, d.<br>Dorsal cirri smooth, not crenulate<br>Same, smaller<br>Single digitiform supraacicular lamella<br>Single subacicular notopodial lamella<br>Same, smaller<br>Single lower neuropodial lamella<br>Ventral cirri with single lamella above and smaller lamella below |

Remarks.—The types of *Nereis* (*Leptonereis*) *egregicirrata* Treadwell were collected by submarine light at English Harbor, Antigua, by the Barbados-Antigua Expedition from the University of Iowa. The nine specimens present in the type material are a mixture of male and female heteronereids of at least two species. Since the description is confusing, being based on more than one species, I have selected as lectotype for *N. egregicirrata* one of the two male heteronereids with the enormously elongated dorsal cirri on

setiger 6, as figured by Treadwell (1924, fig. 24). The rest of the specimens were separated as follows:

Anterior notopodia with 3 ligules (Fig. 5, *a*, *c*):

Male heteronereids: With enormously elongated dorsal cirri on setiger 6 (Fig. 4, *a*; fig. 24 in Treadwell, 1924); dorsal cirri of modified region crenulate (Fig. 5, *b*); anterior unmodified region with 18 setigers.—Lectotype and paratype of *N. egregicirrata*, 2 specimens.

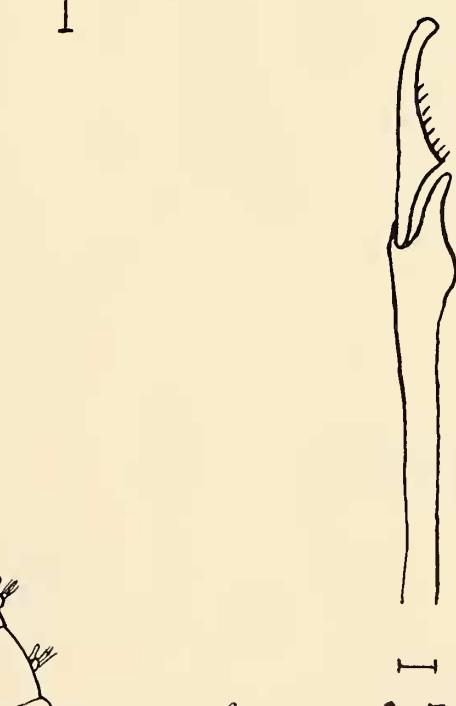
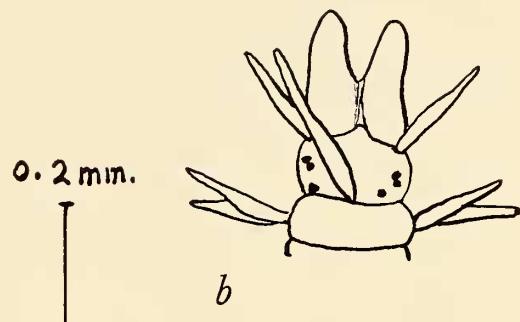
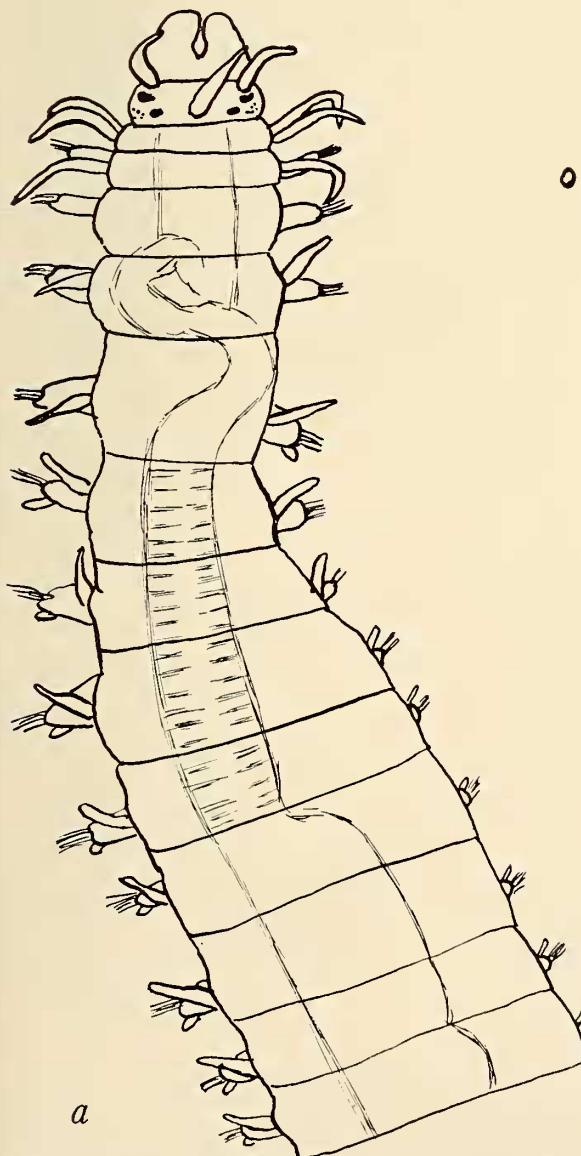


FIG. 2.—*Brania wellfleetensis*, n.sp.: *a*, Dorsal view anterior end; *b*, dorsal view prostomium, sketched from life; *c*, compound falcigerous seta.

Female heteronereids: Dorsal cirri of modified region smooth, not crenulate (Fig. 5, *d*); anterior unmodified region with 26 setigers.

—Paratypes of *N. egregicirrata*, 3 specimens.

Anterior notopodia with 2 ligules (Fig. 6, *a*):

Male heteronereids: Dorsal cirri of modified region crenulate (Fig. 6, *h*); anterior unmodified region with 14 setigers.—Paratypes of *N. alleneae*, n. sp., 3 specimens.

Female heteronereid: Dorsal cirri of modified region smooth, not crenulate (Fig. 6, *g*); anterior unmodified region with 26 setigers, filled with large yolk-like eggs (Fig. 4, *d*).—Paratype of *N. alleneae*, n. sp., 1 specimen.

The species was originally placed in the subgenus *Leptonereis* because of the supposed absence

of paragnaths. Treadwell, 1939, indicated that paragnaths were present and referred it to *Nereis*. The males and females of the two species are superficially similar and agree in the following: They are all small, less than 15 mm long; they are mostly faintly transversely banded with darker glandular areas at the dorsal bases of some of the parapodia; the anterior part of the prostomium is bent ventrally, so that the palps and frontal antennae are not visible dorsally; the 4 eyes are large, purple, subequal, with prominent lenses.

*Nereis egregicirrata* suggests a resemblance to *Nereis articulata* Ehlers, 1887, from off Sand Key, Fla., 120 fathoms. The type of the latter in the Museum of Comparative Zoology, Harvard, was

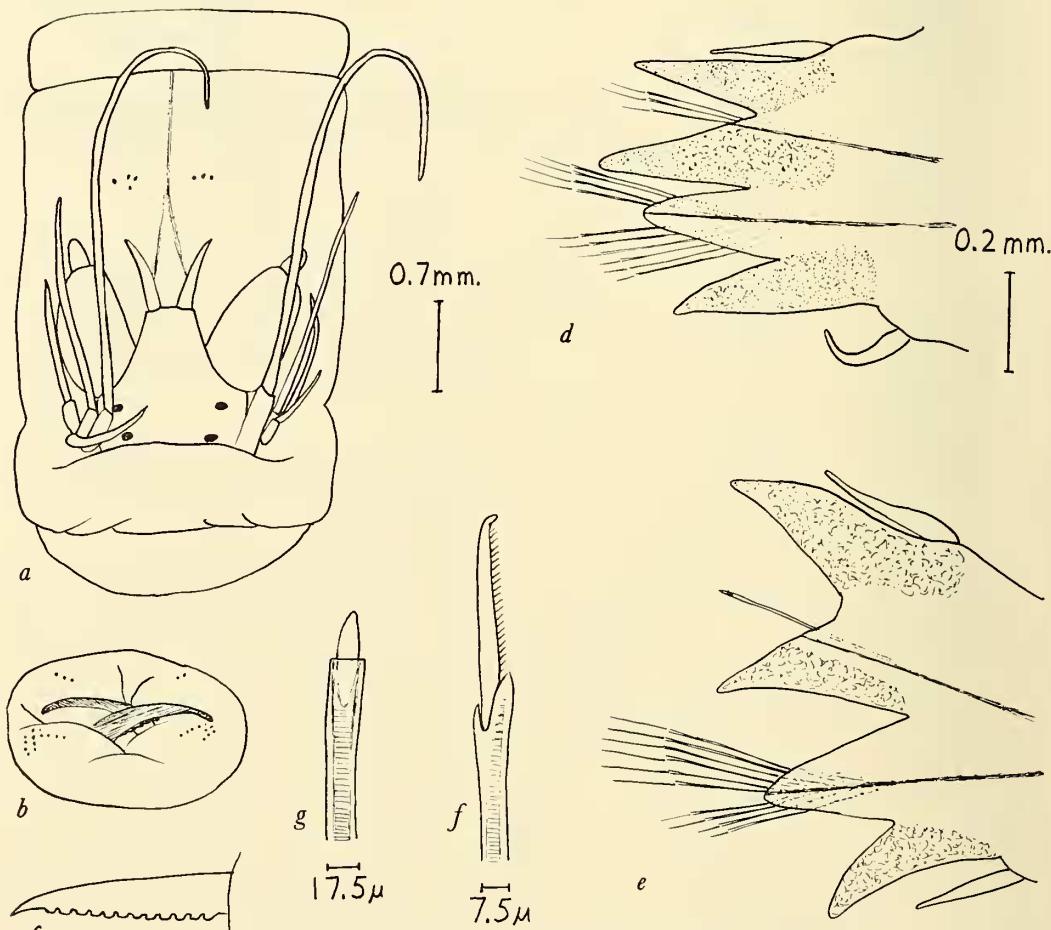


FIG. 3.—*Nereis grayi* n.sp.: *a*, Dorsal view anterior end, with proboscis partially extended; paragnaths of area VI on oral ring are shown; *b*, frontal view of extended proboscis showing maxillary ring with paragnaths on areas II (upper) and IV (lower) and jaws; *c*, one of the jaws showing the arrangement of teeth; *d*, parapodium from anterior region of body; *e*, same, from middle region; *f*, a lower neuropodial heterogomph falciger from anterior parapodium; *g*, a notopodial homogomph falciger from middle parapodium.

examined for comparison; it is a single small atokous form in very poor condition—it is brittle, brown, with pharynx and most of the setae missing. The species agree in that the tentacular cirri are articulated, the parapodia seem similar; also they have glands at the bases of the parapodia. A similar type of elongated dorsal cirri for the male heteronereid is reported for *Nereis abnormis* Horst, 1924, p. 163, from the Netherlands East Indies; in this case, it is the dorsal cirri of the

seventh setiger that is enlarged instead of the sixth as in *N. egregicirrata*.

*Distribution*.—West Indies: Antigua, Puerto Rico; in surface waters (March, July).

***Nereis allenae*, n. sp.**

Figs. 4, b-f; 6, a-h

The description is based on the following: Type (U.S.N.M. no. 27778): A single female heteronereid massed with unusually large eggs

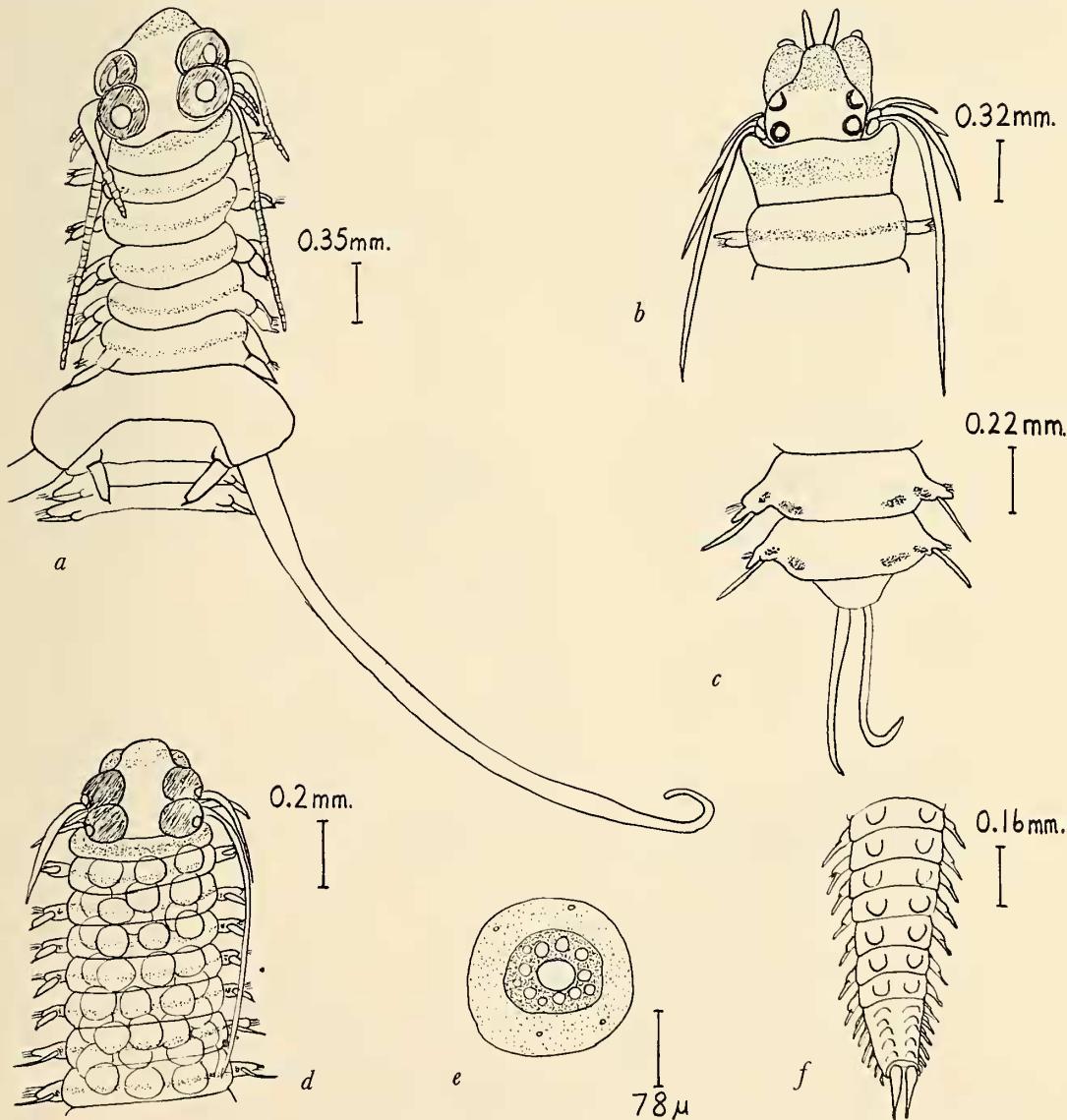


FIG. 4.—*Nereis egregicirrata*: a, Dorsal view anterior end of male heteronereid showing enormously elongated dorsal cirri on setiger 6. *Nereis allenae*, n. sp.: b, Dorsal view anterior end of atokous form; c, dorsal view posterior end of same; d, dorsal view anterior end of female heteronereid; e, one of large yolk eggs of same; f, dorsal view posterior end of male heteronereid.

from reef between the Laboratory and Caballo Blanco Island, Parguera, Porto Rico, evening, 15 September 1955, collected by M. Jean Allen, after whom the species is named; it is unusual in that the eggs were laid in short alga-like strings; paratypes (U.S.N.M. no. 27779): a single female heteronereid (massed with large eggs) and 3 male heteronereids removed from the type material of *Nereis egregicirrata* Treadwell (see above), collected at submarine light, English Harbor, Antigua, July 1918; paratypes (U.S.N.M. no. 27780): 3 atokous specimens which were mixed with other species, collected from Pelican Island, Barbados, from the Barbados-Antigua Expedition, 1918.

*Description of the atokous form.*—Length up to 27 mm, width up to 1 mm, segments about 80. Body long, slender, slightly flattened dorsoventrally, tapered gradually posteriorly. Prostomium (Fig. 4, b) widest basally, narrowed on anterior half; frontal antennae slender, palps bulbous with retractile tips, of about same length as antennae;

4 eyes on posterior half of prostomium, violet, rather large, subequal. Tentacular segment of about same length as following segments; tentacular cirri short to longer, the longest reach setiger 4. Posterior end (Fig. 4, c) with bulbous anal segment, with pair of long anal cirri. Parapodia (Fig. 6, a, b) similar throughout the length of the body. Dorsal cirri much longer than the ligules; notopodium with 2 rounded to conical ligules, with small acicular lobe on upper side of lower ligule (no distinct middle ligule), with homogomph spinigerous setae (without homogomph falcigers in middle and posterior part of body); neuropodium with conical setigerous lobe with anterior and posterior lips, with conical lower ligule; upper group of neurosetae homogomph spinigers and heterogomph falcigers; lower group of neurosetae heterogomph spinigers and falcigers; heterogomph falcigers of anterior region with short blades (Fig. 6, c); in middle and posterior regions, upper group of neurosetae with homogomph spinigers and few (1-3) heterogomph

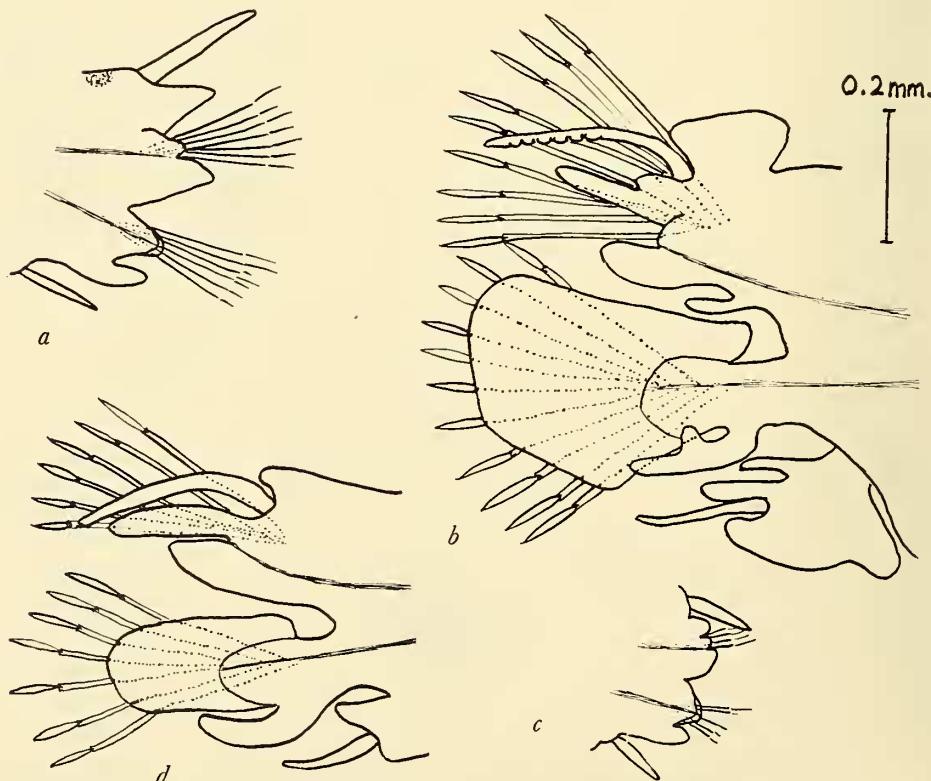


FIG. 5.—*Nereis egregicirrata*: a, Parapodium from anterior unmodified region of male heteronereid; b, parapodium from posterior modified region of same; c, parapodium from anterior unmodified region of female heteronereid; d, parapodium from posterior modified region of same. (All parapodia drawn to same scale.)

falcigers that are stouter than the others (Fig. 6, *d*); lower group of falcigers more slender with short blades (Fig. 6, *e*); acicula dark amber-colored. Proboscis with dark amber-colored jaws, with conical amber-colored paragnathes on both

maxillary and oral rings (exact arrangement?). Color (in alcohol): With brownish pigment on anterior part of prostomium including palps, with a wide band on the tentacular segment and narrow transverse bands both dorsally and

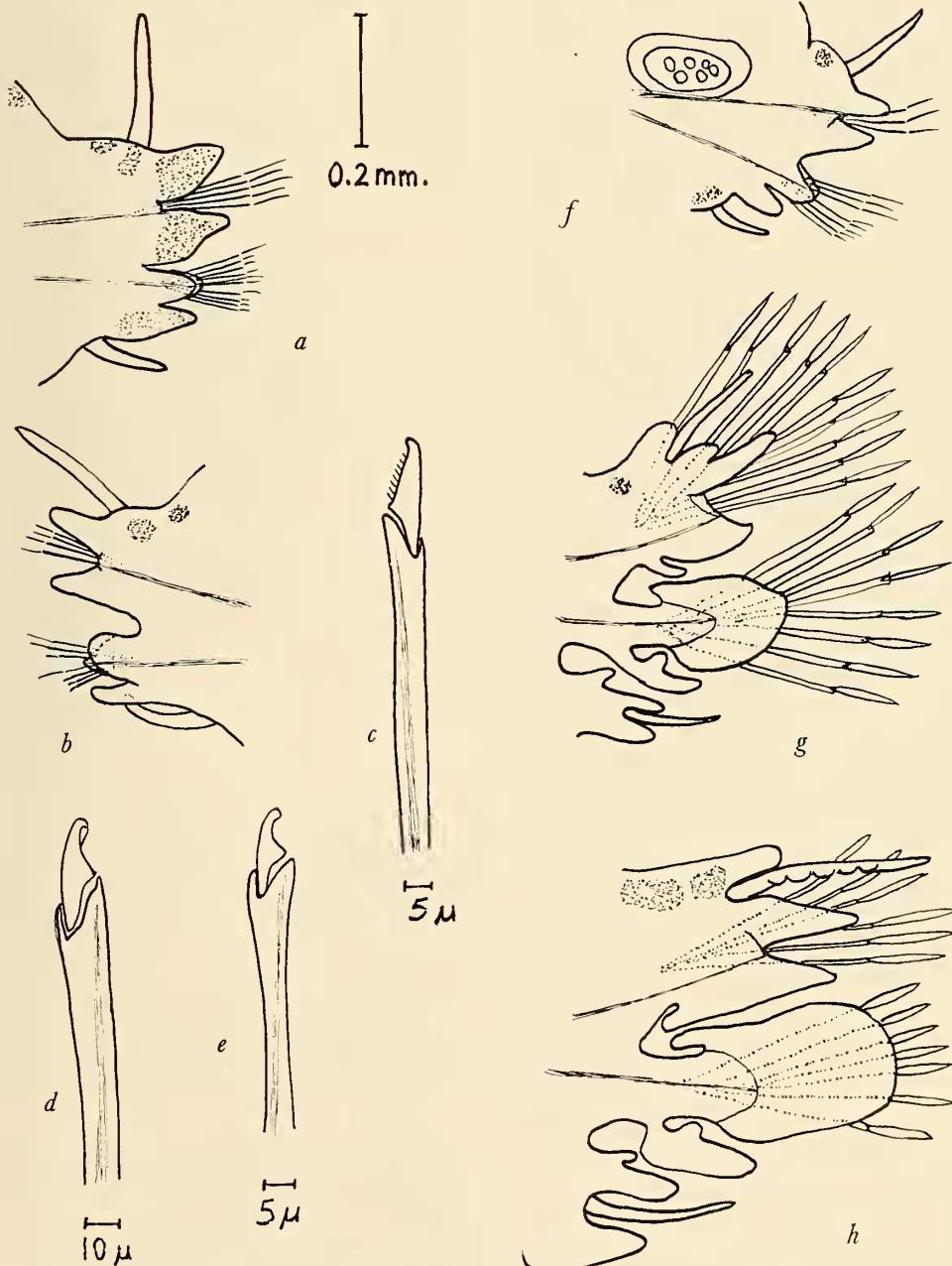


FIG. 6.—*Nereis alleneae*, n.sp.: *a*, Parapodium from anterior region of atokous form; *b*, same, from middle region of body; *c*, heterogomph falcigerous seta from anterior parapodium of atokous form; *d*, heterogomph falcigerous seta from upper group of neurosetae from middle parapodium of atokous form; *e*, same, from lower group of neurosetae; *f*, parapodium from anterior part of body of female heteronereid; *g*, same, from posterior modified region; *h*, parapodium from modified region of male heteronereid. (All parapodia drawn to same scale.)

ventrally on most of the segments; also brownish glandular areas laterally within the body—at the bases of the parapodia dorsally and ventrally, at the bases of the dorsal and ventral cirri, and in the ligules (Fig. 4, b, c).

*Description of male and female heteronereids.*—Body divided into two distinct regions: anterior unmodified, with the usual type of setae; posterior modified, with the usual type of setae replaced by swimming setae and the development of lamellae instead of ligules; in addition in the male, there is a posterior "tail" region of about 12 segments which lack the modified parapodia; also there are paired dorsal knobs on the last 19 or so segments, giving the "tail" a characteristic aspect (Fig. 4, f). Prostomium (Fig. 4, d) with anterior part bent down ventrally, thus the frontal antennae and palps are not visible dorsally; four eyes large, bulging, subequal, purple, with distinct lenses, the 2 on each side closely appressed. Tentacular segment of female with lower 2 pairs of tentacular cirri short, upper anterior pair extending to setiger 2, upper posterior pair extending to setiger 7; in the males, the tentacular cirri were broken off except for one rather short pair. Parapodia of anterior unmodified region (Fig. 6, f) similar to atokous form. In the female, the body wall of the anterior unmodified segments is very thin, transparent; this region is massed with large yolk eggs (about 160  $\mu$  in diameter); the eggs have an outer finely granular portion and an inner denser portion with the large nucleus and a number of large oil globules (Fig. 4, d, e); these eggs were reported by the collector as being laid in short alga-like strings; the eggs made up a single row of cells, some strings with approximately 30 eggs; within about an hour after laying, the "jelly" holding the eggs together had dissolved. The male and female heteronereids differ in the following:

|  | <i>Male heteronereid</i>  | <i>Female heteronereid</i>                                      |
|--|---|---|
| Length   | Up to 12 mm.  | Up to 14 mm   |
| Width  | Up to 1.5 mm in anterior region; up to 2.5 mm in posterior region | Up to 1.5 mm in anterior region; up to 2 mm in posterior region |
| Number of setigers in anterior unmodified region | 14  | 26  |
| Number of setigers in posterior modified region  | About 46 plus 12 in "tail"  | About 55  |
| Total number of setigers                         | About 72  | About 81  |

|  |   |  |
|--|---|--|
| Posterior end                                    | Pair of dorsal papillae (ventral anal cirri missing); with a pair of dorsal knobs on the last 19 or so segments (Fig. 4, f)   | Bulbous anal segment (anal cirri missing)  |
| Dorsal cirri of anterior region                  | First 7 pairs elongated, clubbed, become longer posteriorly   | First 5 pairs slightly modified, clubbed   |
| Ventral cirri of anterior region                 | First 4 pairs clubbed   | First 5 pairs slightly modified, clubbed   |
| Parapodia of modified region with swimming setae | Fig. 6, h<br>Dorsal cirri crenulate on lower margin<br>Extra lamella above base of dorsal cirrus<br>Single supraacicular notopodial lamella<br>Single large subacicular notopodial lamella<br>Large rounded post-setal neuropodial lamella<br>Unequally bilobed lower neuropodial lamella<br>Ventral cirri with bilobed lamella above and large lamella below | Fig. 6, g<br>Dorsal cirri smooth, not crenulate<br>Same<br>Unequally bilobed supraacicular notopodial lamella<br>Unequally bilobed subacicular notopodial lamella<br>Same, smaller<br>Same<br>Same, smaller  |
| Color  | Not banded; dark glands at bases of parapodia dorsally  | Pigmented on anterior part of prostomium and palps, wide band on tentacular segment, with narrow transverse bands on rest of segments dorsally and ventrally, with darker spots at the bases of the parapodia and bases of the dorsal and ventral cirri. |

*Distribution.*—West Indies: Porto Rico, Antigua, Barbados; heteronereids at surface (July, September).

#### *Nereis (Nereis) pelagica* Linné, 1758

*Nereis largoensis* Treadwell, 1931, p. 3.—not Behre, 1950, p. 12.

*Nereis pelagica largoensis* Hartman, 1956, pp. 255, 280.

*Remarks.*—The type of *Nereis largoensis* Treadwell, 1931, from Key Largo, Florida, deposited in the American Museum of Natural History, was examined. It has been referred to *Nereis pelagica largoensis* by Hartman, 1956. In comparing it with specimens of the more northern *N. pelagica*, it seems to be identical; the paragnath arrangement falls within the variation found in *N. pelagica*; the posterior notopodial

lobes are no more enlarged than is found in the more northern forms. The record of *N. largoensis* from Grand Isle, La., by Behre, 1950, was based on specimens deposited in the United States National Museum and identified by Treadwell; on examination, they proved to be *occidentalis* and not *largoensis*.

**Distribution.**—Widely distributed in the Arctic. Also Iceland, Norway to Mediterranean; Hudson Bay to Long Island Sound, Florida (Key Largo); Bering Sea to Panamá; north Japan Sea to Japan; South Atlantic (Tristan da Cunha, Kerguelen, Magellan Straits). In low water to 609 fathoms.

***Nereis (Nereis) occidentalis* Hartman, 1945**

Fig. 7, a-d; 8, a-g

*Nereis pelagica occidentalis* Hartman, 1945, p. 20, pl. 4, figs. 1-6; 1951, p. 46.—Behre, 1950, p. 12. *Neanthes oligohalina* Rioja, 1946, p. 207, pl. 1, figs. 3-6; pl. 2, figs. 13-19. *Nereis largoensis* Behre, 1950, p. 12.—Hartman, 1951, p. 45, pl. 13, fig. 5 (part; from Grand Isle, La.); not Treadwell, 1931.

Heteronereid epitokous forms of this species (including a single female and 7 males) were collected by Joseph P. Breuer and sent into the Museum for identification; they were collected in Laguna Madre, 25 miles north of Port Isabel, Tex., at night under light, April 15, 1956. The

females have not been described previously and the males only partially. They are described herein and compared with the atokous form. The known distribution of the species is extended from collections in the United States National Museum.

**Description of atokous form.**—Length up to 50 mm, width up to 4 mm, segments about 80. Prostomium of the typical nereid form, with the 4 eyes rather large, subequal. Tentacular segment with 4 pairs of tentacular cirri, the longest reach setigers 3 to 8. Parapodia of anterior region (Fig. 8, a) with ligules short and rounded; the ligules become slightly more elongated and conical in the middle and posterior regions (Fig. 8, b, c). Notopodium with 2 ligules, with a very small supraacicular setigerous lobe between them (not a distinct third ligule); neuropodium with a rounded to conical setigerous lobe and a lower ligule. Dorsal cirri longer than the ligules, ventral cirri slightly shorter. Notosetae of anterior region consist of homogomph spinigers; in the middle and posterior regions, the notosetae become fewer in number, with few (1-2) homogomph falcigers in addition to the spinigers; homogomph falcigers with short blades, with recurved tip and spinous edge (spines may be worn; Fig. 7, c, d). Upper group of neurosetae homogomph spinigers and heterogomph falcigers; lower group of neurosetae heterogomph spinigers and falcigers; hetero-

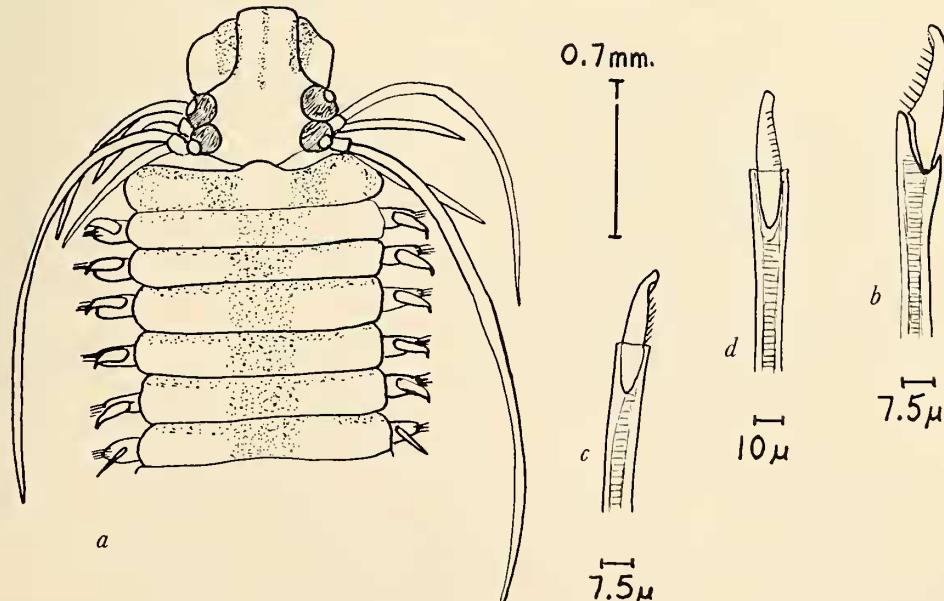


FIG. 7.—*Nereis occidentalis*: a, Dorsal view anterior end of female heteronereid; b, heterogomph falcigerous neuroseta from anterior region of atokous specimen; c, homogomph falcigerous notoseta from posterior region of atokous specimen; d, same, from slightly different angle.

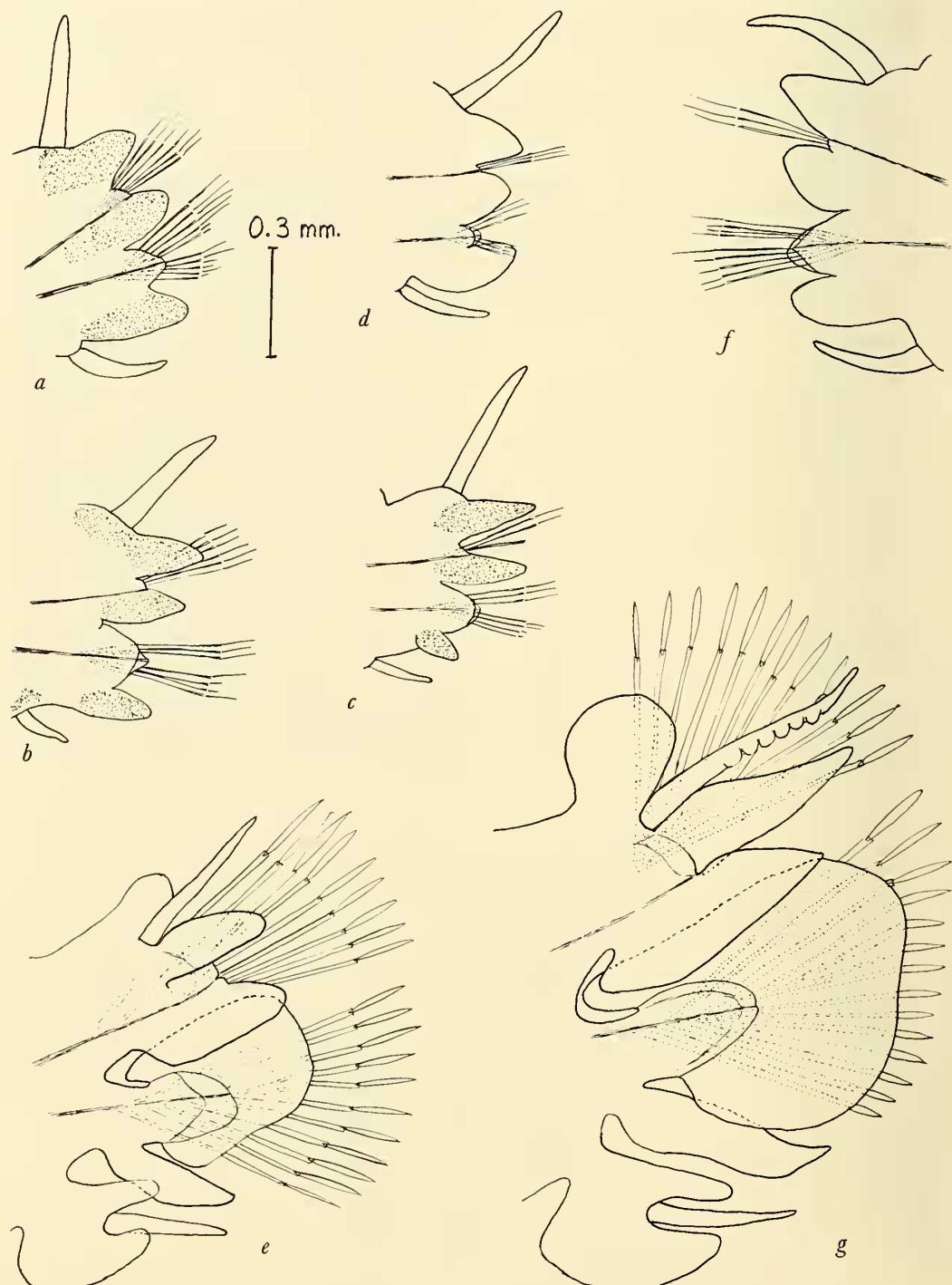


FIG. 8.—*Nereis occidentalis*: a, Parapodium from anterior region of atokous specimen; b, same, from middle region; c, same, from posterior region; d, parapodium from anterior region of female heteronereid; e, same, from posterior modified region; f, parapodium from anterior region of male heteronereid; g, same, from posterior modified region. (All parapodia drawn to same scale.)

gomph falcigers with rather short blades with recurved tip and spinous edge (Fig. 7, b). Acicula black. Proboscis with dark amber-colored jaws, each with 7-8 teeth; paragnaths conical, dark, those of maxillary ring smaller than those of oral ring, arranged as follows: area I, 1-4 (8-12 small ones in var. *oligohalina*); area II, crescent-shaped area of 2 rows; area III, elliptical group of 4-5 rows; area IV, arched group of 3-4 rows; area V, 0 (rarely 1, in var. *oligohalina*); area VI, usually 4 (3-6); areas VII-VIII, continuous, 2-3 rows, subequal, do not get smaller basally. Color (in alcohol): Dusky on prostomium, especially on area in front of eyes, and on some of the anterior body segments.

*Description of the male and female heteronereids.*—Body divided into two regions in the male: anterior region with unmodified segments, posterior region with modified parapodia with swimming setae and lamellae instead of ligules; in addition in the female, there is a short posterior or "tail" region of unmodified segments. Anterior part of prostomium (Fig. 7, a) may or may not be bent ventrally, thus the frontal antennae and palps may be only partially visible dorsally; eyes large, bulging (not as much as in some species of nereids). Parapodia of anterior unmodified region similar to atokous form (Fig. 8, d, f). In life, they were described as bright red in color and active swimmers. The male and female heteronereids differ in the following:

|  | <i>Male heteronereid</i>   | <i>Female heteronereid</i>   |
|--|--|--|
| Length   | Up to 30 mm.   | Up to 23 mm  |
| Width  | Up to 3 mm in anterior region; up to 4 mm in modified region.  | Up to 2 mm in anterior region; up to 3 mm in modified region.      |
| Number of setigers in anterior unmodified region | 16   | 25   |
| Number of setigers in posterior region           | About 75   | About 50, plus 15 in "tail"  |
| Total number of setigers                         | About 90   | About 90   |
| Tentacular cirri                                 | Longest reach setigers 4-6   | Longest reach setiger 10   |
| Anterior dorsal cirri                            | First 7-8 pairs clubbed.   | First 5 pairs clubbed.   |
| Anterior ventral cirri                           | First 5 pairs clubbed.   | Same   |
| Posterior end                                    | Anal segment a papillated disk, with double row of numerous papillae, with or without pair of long anal cirri (may be broken off). | Anal segment bulbous, slightly crenulate, with anal cirri missing. |

|                               |  |  |
|-------------------------------|--|--|
| Color (in alcohol)            | Pigmented dusky area on prostomium anterior to eyes; slight amount on anterior segments. | Same on prostomium; anterior half of anterior unmodified region darkly pigmented (fig. 7, a) |
| Parapodium of modified region | Fig. 8, g<br>Dorsal cirri crenulate with few large crenulations.                         | Fig. 8, e<br>Dorsal cirri smooth, not crenulate.   |
|                               | Rounded lamella above dorsal cirrus.   | Elongated lamella above dorsal cirrus.   |
|                               | Digitiform notopodial lamella below dorsal cirrus.                                       | Same, shorter.   |
|                               | Subaciculate digitiform notopodial lamella.  | Same.  |
|                               | Large rounded post-setal lamella.  | Same, smaller.   |
|                               | Elongated digitiform lower neuropodial lamella.  | Same.  |
|                               | Elongated lamella above and rounded lamella below ventral cirrus.                        | Same.  |

*Biology.*—*Nereis occidentalis* is found intertidally and dredged in shallow depths. It is found on mud flats and sandy shoals, among ascidian and sponge masses, tube masses of maldanids, as *Petaloprotus*, oyster clusters and between shells of mussels, as *Mytilus*; it is found on piles, scrapings from floating buoys, and washed from sea weeds. The species evidently has a wide salinity tolerance, as it has been found in estuaries along with *Nereis succinea* (Frey and Leuckart). Epitokes have been found swarming at the surface in April in Texas (Corpus Christi, April 29, 1950, Hartman, 1951; Laguna Madre, April 15, 1956, collected by J. P. Breuer); early epitokes have been found in North Carolina in June (Beaufort, Hartman, 1945).

*Records.*—North Carolina (Beaufort), Florida (Port St. Joe, Gullport), Louisiana (Grand Isle), Texas (Corpus Christi, Laguna Madre), Mexico (Vera Cruz, Tecolutla), Porto Rico (Arroyo, Ensenada Honda, Culebra).

*Distribution.*—West Indies (Porto Rico), North Carolina, Gulf of Mexico (Florida to Mexico). In low water and shallow waters; sexual epitokes at surface.

## REFERENCES

BEHRE, E. *Annotated list of the fauna of the Grand Isle region*. Occ. Pap. Mar. Lab. Louisiana State Univ., no. 6: 66 pp. 1950.

EHLERS, E. *Report on the annelids of the dredging expedition of the U.S. Coast Survey steamer Blake*. Mem. Mus. Comp. Zool. 15: 335 pp., 60 pls. 1887.

HARTMAN, O. *The marine annelids of North*

*Carolina*. Bull. Duke Univ. Mar. Stat., no. 2: 51 pp., 10 pls. 1945.

—. *The littoral marine annelids of the Gulf of Mexico*. Publ. Inst. Mar. Sci. **2**(1): 7-124, 27 pls. 1951.

—. *Polychaetous annelids erected by Treadwell, 1891 to 1948, together with a brief chronology*. Bull. Amer. Mus. Nat. Hist. **109**(2): 243-310. 1956.

HORST, R. *Polychaeta errantia of the Siboga Expedition*. Pt. 3: *Nereidae and Hesionidae*. Siboga-Exped. **99** (Monogr. 24, 1c): 145-198, 7 pls. 1924.

RIOJA, E. *Estudios Anelidologicos. XV. Nereidos de agua salobre de los esteros del litoral del Golfo de Mexico*. Anal. Inst. Biol. México **17**: 205-214, 2 pls. 1946.

TREADWELL, A. L. *Polychaetous annelids, collected by the Barbados-Antigua Expedition from the University of Iowa in 1918*. Univ. Iowa Stud. **10**(4): 23 pp., 2 pls. 1924.

—. *New species of polychaetous annelids from California, Mexico, Porto Rico, and Jamaica*. Amer. Mus. Nov. no. 482: 7 pp., 21 figs. 1931.

—. *Polychaetous annelids of Porto Rico and vicinity*. Sci. Surv. Porto Rico and the Virgin Islands, New York Acad. Sci., **16**(2): 151-318, 118 figs. 1939.

WEBSTER, H. E. *The Annelida Chaetopoda of New Jersey*. Ann. Rep. New York Mus. Nat. Hist., no. 32: 101-128. 1880.

—. *The Annelida Chaetopoda of New Jersey*. Ann. Rep. New York Mus. Nat. Hist., no. 39: 128-159, pls. 4-10. 1886.

WEBSTER, H. E., and BENEDICT, J. *The Annelida Chaetopoda from Provincetown and Wellfleet, Massachusetts*. Rep. Comm. Fish and Fisheries for 1881: 699-747, 8 pls. 1884.

## LOW TEMPERATURE STORAGE OF FREE RADICALS

The National Bureau of Standards has developed a technique for capturing and storing large numbers of highly reactive molecular fragments at temperatures near absolute zero. By this method unstable atoms and free radicals, known to exist but momentarily in flames and hot gases, are produced in an electric discharge, frozen into immobility, and trapped in solid form. Because these atoms are frozen in the excited state, they can be conveniently studied by optical spectroscopy.

In experiments to date the Bureau has produced solids containing atomic nitrogen and oxygen, and possibly atomic hydrogen and an unstable hydroxy (OH) molecule. These solids have very unusual properties, emitting bright glows, blue "flames," and colored flashes of light. When warmed 20° or 30°, they combine very actively, releasing large quantities of stored energy, principally as heat. Other possible fields of application include solid state physics and basic chemistry. Here the trapped atoms could be used as powerful probes into the solids containing them. From a study of their properties, information could be obtained about the arrangement of the atoms and molecules in the solid and about the forces acting on them. Similarly the mechanism of diffusion of atoms and of reactions between atoms and molecules could be studied.

These experiments were begun at NBS in 1954 by H. P. Broida and J. R. Pellam<sup>1</sup> and are being continued by H. P. Broida, A. Bass, and O. Lutes<sup>2</sup> of the Bureau's temperature measurements laboratory. C. M. Herzfeld of NBS is carrying out theoretical investigations<sup>3</sup> on the systems. The research is supported chiefly by the Office of Naval Research and the U. S. Air Force through the Office of Scientific Research of the Air Research and Development Command.

Within the last five years several methods have been developed in other laboratories for stabilizing free radicals at low temperatures. However, the present technique has the advantage that the free radicals are stored in highly excited states as a result of the electric discharge, making it possible to study and analyze them by spectroscopic techniques. Also, since the radicals are collected at much lower temperatures than in previous methods, they can be stored longer in the uncombined form.

In this method gases containing molecules

<sup>1</sup> BROIDA, H. P., and PELLAM, J. R., Phys. Rev. **95**: 845, 1954; BROIDA, H. P., and PELLAM, J. R., Journ. Chem. Phys. **23**: 409, 1955.

<sup>2</sup> BASS, A. M., and BROIDA, H. P., Phys. Rev. **101**: 1740, 1956; BROIDA, H. P., and LUTES, O. S., Journ. Chem. Phys. **24**: 484, 1956.

<sup>3</sup> HERZFELD, C. M., and BROIDA, H. P., Phys. Rev. **101**: 606, 1955.